We Claim:

1. A method for controlling an engine having an exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion of said NOx during stoichiometric or rich operating conditions, the method comprising:

operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

after said lean operation, operating the engine to produce a rich exhaust gas mixture fed to the emission control device, said rich air-fuel ratio determined as a function of at least the oxygen storage capacity of the device.

2. The method of claim 1 wherein said rich air-fuel ratio is further based on temperature of the device.

3. The method of claim 1 wherein as oxygen storage capacity of the device decreases, the rich air-fuel ratio becomes less rich.

4. The method of claim 1 wherein the rich air-fuel ratio is selected to provide a select amount of CO and H2.

5. The method of claim 1 wherein the oxygen storage capacity of the device is determined based on device degradation.

6. The method of claim 5 wherein device degradation is based on at least one of an amount of sulfur contaminating the device and thermal degradation of the device.

7. The method of claim 1 wherein the oxygen storage capacity of the device is determined from rich to lean transition time.

8. A method for controlling an engine having an exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion said NOx during stoichiometric or rich operating conditions, the method comprising:

operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

estimating the amount of NOx release based on the oxygen storage capacity of the device;

after said lean operation, operating the engine to produce a rich exhaust gas mixture fed to the emission control device, said rich air-fuel ratio is determined based at least on the amount of NOx released.

9. The method of claim 8 wherein said rich air-fuel ratio is further based on temperature of the device.

10. The method of claim 8 wherein said amount of NOx release is further based on operating conditions.

11. The method of claim 8 wherein as oxygen storage capacity of the device decreases the rich air-fuel ratio becomes less rich.

12. The method of claim 8 wherein the rich air-fuel ratio is selected to provide a selected amount of CO and H2 to the device.

13. The method of claim 8 wherein the oxygen storage capacity of the device is determined based on device degradation.

14. The method of claim 13 wherein device degradation is based on an amount of sulfur contaminating the device.

15. The method of claim 8 wherein the oxygen storage capacity of the device is determined from rich to lean transition time.

16. A computer storage medium having instructions encoded therein for controlling an engine having an

exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion of said NOx during stoichiometric or rich operating conditions, said medium comprising:

code for operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

after said lean operation, code for operating the engine to produce a rich exhaust gas mixture fed to the emission control device, said rich air-fuel ratio determined as a function of at least the oxygen storage capacity of the device.